# CLAIMS

What is claimed is:

1. An electrospray apparatus, comprising:

a nozzle defining an exit orifice, an entrance orifice, and a first passage extending from the entrance orifice to the exit orifice, the nozzle defining a nozzle axis;

an interface defining an inlet, an outlet, and a second passage extending from the inlet to the outlet, the interface defining an interface axis; the interface disposed such that the inlet is adjacent the exit orifice and the interface axis is in transverse relation to the nozzle axis; wherein an angle formed between the nozzle axis and the interface axis is between about 75 degrees and about 105 degrees, the interface operable to receive a voltage from an interface voltage source;

an auxiliary electrode operable to receive a voltage from an auxiliary voltage source, the auxiliary electrode operable to modulate an electric field at the exit orifice and disposed in operable relation to the exit orifice,

the electrospray apparatus operable to define an ion pathway followed by ions enroute from the exit orifice to the inlet, the auxiliary electrode disposed outside the ion pathway.

2. The electrospray apparatus of claim 1, wherein the interface further comprises a housing defining an opening disposed adjacent the inlet, the housing defining a lumen for transporting a gas, the lumen in fluid communication with the opening.

3. The electrospray apparatus of claim 2, the housing disposed such that the interface axis passes through the opening.

4. The electrospray apparatus of claim 2, wherein the housing is electrically conductive and is operable to receive a voltage from a housing voltage source.

5. The electrospray apparatus of claim 1, wherein the auxiliary electrode is disposed such that an angle of less than 15 degrees is subtended between the auxiliary electrode and the interface axis, said angle having its vertex at the inlet.

6. The electrospray apparatus of claim 5, wherein the distance between the exit orifice and the auxiliary electrode is greater than the distance between the inlet and the exit orifice.

7. The electrospray apparatus of claim 5, wherein the auxiliary electrode is disposed on the interface axis.

8. The electrospray apparatus of claim 1, wherein the auxiliary electrode is disposed such that an angle of less than 15 degrees is subtended between the auxiliary electrode and the nozzle axis, said angle having its vertex at the exit orifice.

9. The electrospray apparatus of claim 8, wherein the distance between the exit orifice and the auxiliary electrode is greater than the distance between the inlet and the exit orifice.

10. The electrospray apparatus of claim 8, wherein the auxiliary electrode is disposed on the nozzle axis.

11. The electrospray apparatus of claim 1,

wherein a nozzle plane is defined that is perpendicular to the nozzle axis and intersects the nozzle axis at the exit orifice,

wherein an interface plane is defined that is perpendicular to the interface axis and intersects the interface axis at the inlet, and

wherein the auxiliary electrode is disposed on the downstream side of the nozzle plane and on the upstream side of the interface plane.

12. The electrospray apparatus of claim 1, wherein the auxiliary electrode is selected from a disk electrode, a pin electrode, and an 'L' shaped electrode.

13. The electrospray apparatus of claim 12, wherein the electrode is a disk electrode that has a diameter of at least about 5 mm and at most about 15 mm.

14. The electrospray apparatus of claim 1, wherein the auxiliary electrode has a convex cylindrical surface having a central axis, the central axis parallel to the nozzle axis.

15. The electrospray apparatus of claim 1, wherein the auxiliary electrode is in electrical communication with the interface such that the auxiliary voltage source is the interface voltage source.

16. The electrospray apparatus of claim 1, wherein the nozzle lacks any annular ring electrode disposed around the exit orifice.

17. A method of converting a liquid solute sample into ionized molecules, comprising:
introducing the liquid solute sample into the entrance orifice of an electrospray apparatus according to claim 1 to deliver the sample to the exit orifice,
applying an interface voltage to the interface,
applying an auxiliary voltage to the auxiliary electrode, the auxiliary voltage in the range from about 50% to about 120% of the interface voltage,
the voltages applied to the interface and to the auxiliary electrode sufficient to subject the sample at the exit orifice and the inlet to an electric field, whereby the sample is discharged from the exit orifice in the form of droplets, the electric field effective to produce ionized molecules from the droplets and urge the ionized molecules towards the inlet.

18. The method according to claim 17, wherein there is a potential difference in the range from 1kV to 8kV between the inlet and the exit orifice.

19. The method according to claim 17, wherein the interface voltage is in the range from -1kV to -8kV and the ionized molecules urged towards the inlet are positively charged.

20. The method according to claim 17, wherein the interface voltage is in the range from +1kV to +8kV and the ionized molecules urged towards the inlet are negatively charged..

21. A method of converting a liquid solute sample into ionized molecules, comprising:
introducing the liquid solute sample into the entrance orifice of an electrospray apparatus according to claim 4 to deliver the sample to the exit orifice,
applying an interface voltage to the inlet of the interface,

applying a housing voltage to the housing, the housing voltage in the range from about 80% to about 100% of the interface voltage,

applying an auxiliary voltage to the auxiliary electrode, the auxiliary voltage in the range from about 50% to about 120% of the interface voltage,

the voltages applied to the inlet of the interface, to the housing, and to the auxiliary electrode sufficient to subject the sample at the exit orifice and the inlet to an electric field, whereby the sample is discharged from the exit orifice in the form of droplets, the electric field effective to produce ionized molecules from the droplets and urge the ionized molecules towards the inlet.

22. The method according to claim 21, further comprising passing a drying gas through the lumen and out the opening such that the droplets encounter the drying gas.

23. The method according to claim 21, wherein there is a potential difference in the range from 1kV to 8kV between the inlet and the exit orifice.

24. The method according to claim 21, wherein the interface voltage is in the range from -1kV to -8kV and the ionized molecules urged towards the inlet are positively charged.

25. The method according to claim 21, wherein the interface voltage is in the range from +1kV to +8kV and the ionized molecules urged towards the inlet are negatively charged..